on the other hand, does its principal wearing on down grades, and especially in cataracts, or, where falling over precipices or obstructions, it can dash the stones, or other grinding material with which it may be charged against the rocky bed below. In such places the erosion caused by ice would be very insignificant or nil. Every one is acquainted with the fantastic forms and miniature pot-holes made in the rocky bed of a stream where it pitches down a cataract. Such cases are common in the carboniferous shales along White Oak run and Laurel run near Archbald, and in the Chemung and Portage rocks of Central New York. In addition to these more specific differences, there is an indefinable one in the softer outlines and appearances of a water-worn surface which generally aids the experienced eye.

Immediately to the north of the lower pot-hole a ledge, that is now breaking up, has this water-worn appearance. Some of the best evidences of the action of water may be seen about 500′ N. 40° W. from the mouth of this hole, and at the foot of the little hill that rises to its north. Here the evidences of wearing by a large stream are unquestionable, although there is now no considerable stream nearer than the Lackawanna at Jermyn, more than a mile and a half away, and 210′ below this level.

On Two New Species of Three-toed Horses from the Upper Miocene, with Notes on the Fauna of the Ticholeptus Beds. By E. D. Cope.

(*Read before the American Philosophical Society, February 19, 1886.*)

ANCHITHERIUM ULTIMUM, sp. nov.

Unusual interest attaches to this horse since it is the latest representative in time of the genus to which it belongs. It is from a horizon above the John Day Miocene, which contains several Loup Fork genera and species, as Protolabis, Hippotherium and Dicotyles. As, however, the *Blastomeryx borealis* Cope occurs at the same locality and horizon, the bed is probably to be referred to the Ticholeptus epoch, which I have shown to be between the John Day and Loup Fork epochs in age, with greater affinities to the latter.* The principal locality is the valley of the Deep river, Montana, but the present species is derived, with those above mentioned, from Cottonwood creek, Oregon.

The *Anchitherium ultimum* is represented in my collection by a nearly complete superior dentition, with palate and sides of skull to the middle of the orbits, and top of skull to above the infraorbital foramen. The size is less than that of the *A. præstans* Cope and *A. equiceps* Cope (? *A. anceps* Marsh) of the John Day bed, and the dental series has the same length as that of the *A. longiceriste* Cope, also of the John Day. The animal is adult, and anterior teeth are considerably worn. The posterior molars

* See American Naturalist for April, 1886.

do not display any material differences from those of the *A. longicriste.* The premolars and molars have a well-marked external cingulum, and there is an internal cingulum round the base of the second premolar. The only other cingula are weak ones round the bases of the anterior lobes of the second and third true molars. The anterior intermediate tubercle forms an angulation in the outline of the anterior cross-crest of the premolars, and a rounded enlargement in that of the true molars. The posterior intermediate tubercle has a triangular section. The anterior teeth are curiously unsymmetrical. There are six incisors, the third having a more posterior position on one side than on the other, and having a cupped crown. The crowns of the others are lost. On the right side, behind a diastema rather longer than the transverse width of the crown of the third incisor, is a robust canine tooth. On the opposite side there is no canine tooth, nor a trace of one ever having been there. The diastema separating the canine from the first premolar is long. The latter has but one root and has a rather small crown.

It is in the cranial characters that this species displays the greatest differences from the John Day species. In the first place there is a profound and large preorbital fossa, separated from the orbit by a vertical bow. The preorbital fossa in the John Day species is shallow, and not abruptly defined. In the next place the anterior border of the orbit is above the anterior border of the last molar tooth. In this it agrees only with the large *A. præstans;* in the *A. equiceps* and *A. longicriste,* the anterior border of the orbit is above the anterior part of the second superior molar. Thirdly, the infraorbital foramen is above the middle of the fourth premolar; it is over the posterior part of the third in the three John Day species. Finally, the nareal notch marks the anterior two-fifths of the diastema; it extends much further back in the John Day species, marking either the front or middle of the first premolar. The palate extends about as far anteriorly as in *A. præstans,* viz., to opposite the posterior border of the first true premolar.

Measurements.	M.
Length of diastema from I. 3	.047
" " " " C	.035
" " superior molar series	.079
" " " true molars	.034
" " crown of p. m. 1 (greatest)	.007
Diameters of crown of p. m. ii { anteroposterior	.0145
{ transverse	.0145
" " " " m. i { anteroposterior	.011
{ transverse	.015
" " " " m. iii { anteroposterior	.011
{ transverse	.014
Long diameter of crown of I, 3	.007
Depth of muzzle at middle of diastema	.039

For comparison with this specimen I have used five crania of *A. equiceps*, and one of *A. præstans* and *A. longiceriste* each, besides numerous fragmentary jaws.

It was found by Mr. J. L. Wortman in the Ticholeptus beds of Cottonwood creek, Oregon.

I give here a list of the species obtained with this one at the locality in question :

Protohippus, ? sp.
Hippotherium seversum Cope.
" *sinclairi* Wortman.
" *occidentale* Leidy.
Anchitherium ultimum, Cope.
Dicotyles condoni Marsh.
Protolabis transmontanus Cope.
Merycochœrus obliquidens Cope.
Blastomeryx borealis Cope.

The species of the Ticholeptus beds of Montana are the following :

Mastodon proavus Cope.
Protohippus sejunctus Cope.
Merycochœrus montanus Cope.
Merychyus zygomaticus Cope.
" *pariogonus* Cope.
Cyclopidius simus Cope.
Cyclopidius emydinus Cope.
*Pithecistes brevifacies** Cope.
" *decedens* Cope.
" *heterodon* Cope.
Procamelus vel Protolabis, sp.
Blastomeryx borealis Cope.

This horizon is interesting as that in which the genus Mastodon makes its first appearance in America. It is now shown to be the last which contains the genus Anchitherium. See Final Report United States Geological Survey Territories, Vol. iii, p. 18, where some of the characters of this fauna are pointed out. In the list of the Deep River fauna above given occurs the name

MERYCOCHŒRUS OBLIQUIDENS Cope.

This is a species hitherto undescribed, which approaches those of Merychyus in some respects. As it is established on a mandibular ramus only, although this is nearly entire, it cannot be positively decided to which genus it should be referred, as the generic character is only seen in the presence or absence of lachrymal vacuities. However, in all the species of Merychyus, where the parts are preserved, *M. elegans*, *M. arenarum*, and *M. zygomaticus*, the first inferior premolar is one-rooted, while in the species of Merycochœrus it has two roots. In the present animal there are two roots. The symphyseal region is very much contracted, so that if there were three inferior incisors they were small.

This species is smaller than any known species of Merycochœrus, about

*The absence of caries in the teeth of extinct Mammalia is well known. The type specimen of the *Pithecistes brevifacies*, however, displays a carious excavation on the external side of one of its inferior molars. This feature adds to those which indicate the degeneracy and approaching extinction of this type, as I have remarked in my synopsis of the Oreodontidæ, Proceedings American Philosophical Society, 1884, 557.

equaling the larger individuals of *Oreodon culbertsoni*. The molar teeth are, however, relatively larger than in that animal and in the species of Eucrotaphus, and the anterior premolars and incisors smaller and more crowded. The last two premolars are in line, but the second premolar is set obliquely in the jaw so as to overlap the first premolar by the whole of its anterior root, and the third premolar by half of its posterior root. The anterior root is interior, the posterior exterior. The first premolar has a robust root with round section. The crown is but little expanded at the posterior base ; anterior part and apex lost. The alveolus of the canine diverges somewhat outward. The symphyseal suture is short and rather deep. Its posterior edge is below the posterior quarter of the third premolar.

The outline of the jaw is nearly vertical behind, with rounded angle, and abrupt excavation below the condyle. Its edge is beveled outwards except opposite the grinding edge of the last molar where there is a thickening on the external side. The masseteric fossa is well impressed, but rather small, descending only to the line mentioned. On the contrary the fossa of the internal pterygoid muscle occupies the entire jaw behind the line of the third molar, and is bounded posteriorly and at the angle, by an incurved edge. Dental foramen opposite middle of last molar. Mental foramen below posterior edge of second premolar.

Measurements.	M.
Length of ramus at line of mental foramen	.150
" " molar series	.096
" " premolar series	.042
" " third premolar	.0125
" " fourth "	.013
Diameters m. ii { anteroposterior	.0165
Diameters m. ii { transverse	.012
Length of m. iii	.025
Depth ramus at p-m. iii	.030
" " " m. iii, front	.035

In the *Merychyus pariogonus* Cope of the Deep River Ticholeptus bed, the posterior part of the ramus is more expanded, and is perfectly rounded, while the other dimensions are considerably smaller.

From Cottonwood creek, Oregon ; J. L. Wortman.

HIPPOTHERIUM RECTIDENS, sp. nov.

The probable Loup Fork Upper Miocene formation of Tehuichila, State of Vera Cruz, Mexico, has yielded a third species of three-toed horse, which differs from any of those known to me * I owe the superior molar tooth on which the evidence depends, to my friend, Dr. Santiago Bernad, to whom I am already indebted for the other species known to me, and

*See Proceedings American Philosoph. Society, 1885, p. 150 (1886), for descriptions of two species, *Hippotherium peninsulatum* and *Protohippus castilli*.

described in the Proceedings of the American Philosophical Society, 1885, p. 150. The present animal presents very nearly the same enamel folds as the *H. peninsulatum* Cope, of the same locality, including the subquadrate central loop which is nearly cut off from the anterior lake. But the tooth differs in two essential points, and in some minor ones from that species. It is considerably larger, presenting .6 more area of the grinding surface. The shaft of the tooth, instead of being strongly curved, is straight. Less reliable characters are, first, that the crown is nearly square, while it is oblong in the *H. peninsulatum;* and second, that there are two large loops extending inwards towards the column instead of one. This character may or may not depend on the position of the tooth. Diameters of crown, transverse, 21.5 mm.; anteroposterior, 21.5 mm.; longitudinal, 450 mm. I propose that the species be called *Hippotherium rectidens.*

Vocabulary of the Selish Language. By W. J. Hoffman, M.D., Washington, D. C.

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The Selish, or Flathead tribe of Indians, is one of a group of tribes constituting what may be termed the eastern division of the Selishan linguistic stock. The tribe is at present located in Jocko valley, Northwestern Montana, near the eastern spurs of the Rocky mountains. The surrounding country is extremely fertile, and abounds in game. The tribe numbers less than one hundred and fifty souls, and the primitive customs are fast giving way to the modern innovations of civilization.

In the accompanying vocabulary, which was obtained in 1884, a peculiarity will be observed in the terms of relationship which is of more than ordinary interest, especially terms which indicate a relative as living, or dead, changes being made after the demise of an individual because the name of the dead is not spoken aloud or in the presence of other relatives.

The words are spelled phonetically, with the addition of a letter or two to simplify orthography, and a few characters as explained below :

a, has the sound of *a* in father.

â, " " " " " " law.

q. " " " " ch, in the German *nicht.*

x, " " " " gh, " " Arabic *gh,* or German *nacht.*

˘, ¯, placed over vowels indicate respectively, short and long sounds.

', indicates an interruption in sound.

/, the accent indicates accented letters, or syllables.

^{n}, the superior ^{n}, as in e^n, indicates nasalized sounds of letters to which it may be attached.

Italicized letters are whispered.

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